Eucalyptus Overview

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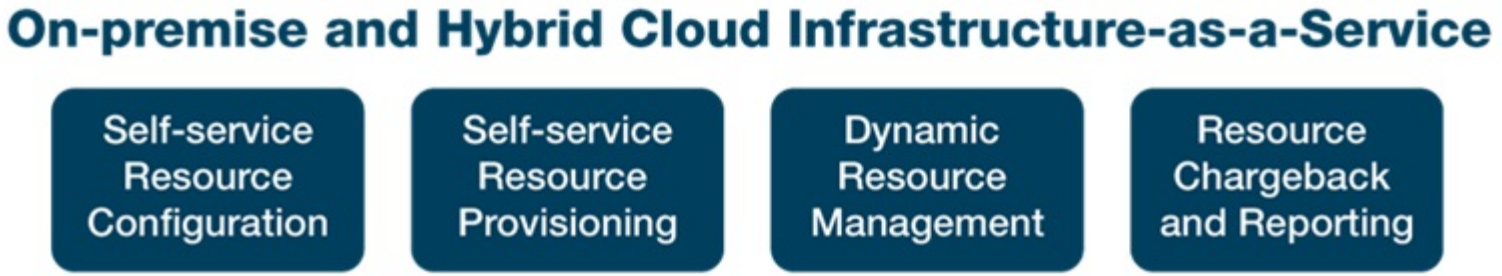
Eucalyptus Overview

- Most widely-deployed s/w platform for on-premise IaaS
  - 25,000+ cloud starts to date and growing
  - Gartner-recognized as major IaaS provider
  - Open source developed
- AWS-compatible enabling federation with Amazon EC2, S3, EBS services (Hybrid cloud, On/Off-ramp to/from AWS)
- Enterprise production deployments worldwide
- Deep cloud partner and AWS ecosystem
- Strong management team and global employee base
  - Marten Mickos, CEO (former MySQL CEO), other execs from Red Hat, VMWare, HP, Sun Microsystems
  - Privately held, HQ'd in Santa Barbara, CA, est. in Jan. 2009
- World class and worldwide Support, Consulting, and Training Services to complement the platform

What is Eucalyptus?

Eucalyptus is an open-source software platform that enables Infrastructure as a Service (IaaS) through the pooling and abstraction of existing on-premise compute, networking, and storage resources that is exposed via Amazon compatible web services API's to users, toolsets, & applications

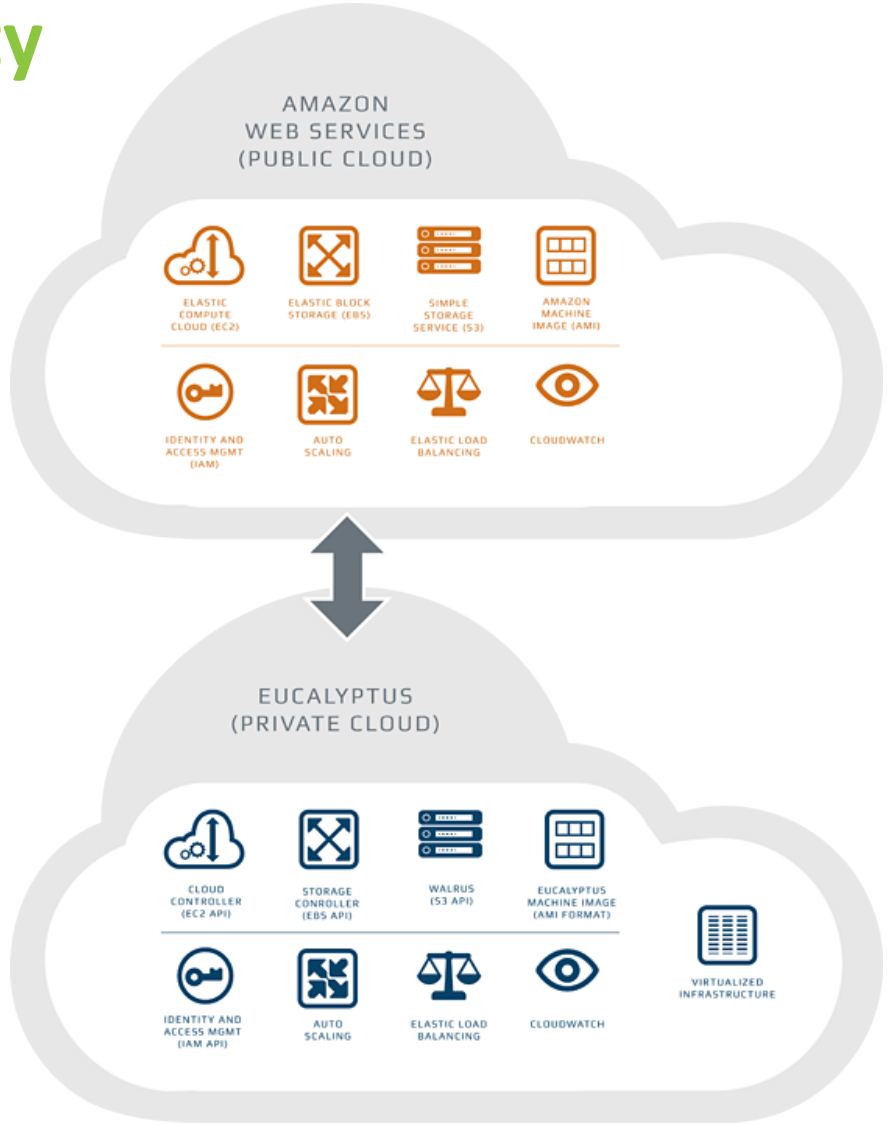


What does Eucalyptus provide?

- Cloud computing functionality via Amazon Web Services™ APIs to enable Self Service and automated IT
- Microsoft Windows™ and Linux guest OS's
- Manages mixed hypervisor environments including KVM, VMware ESX™ and ESXi™ hypervisors
- Self-service end-user console.
- Provides fine grained management control of self service access
    - Allows resource quotas for accounts, groups, & users
    - Supports usage reporting of resources by accounts, groups, & users
    - Admin friendly –scriptable Command Line tools & GUI, integration with AD/ LDAP
- Scalable High Availability Architecture
    - Hardware, Storage, and Networking agnostic
    - Resources managed and scaled out using clusters
    - Clusters can manage node routing – simplified networking

AWS Feature Compatibility

- Amazon Elastic Compute Cloud (EC2)
- Amazon Elastic Block Storage (EBS)
- Amazon Machine Image (AMI)
- Amazon Simple Storage Service (S3)
- Amazon Identity and Access Management (IAM)
- Auto Scaling
- Elastic Load Balancing
- Amazon CloudWatch



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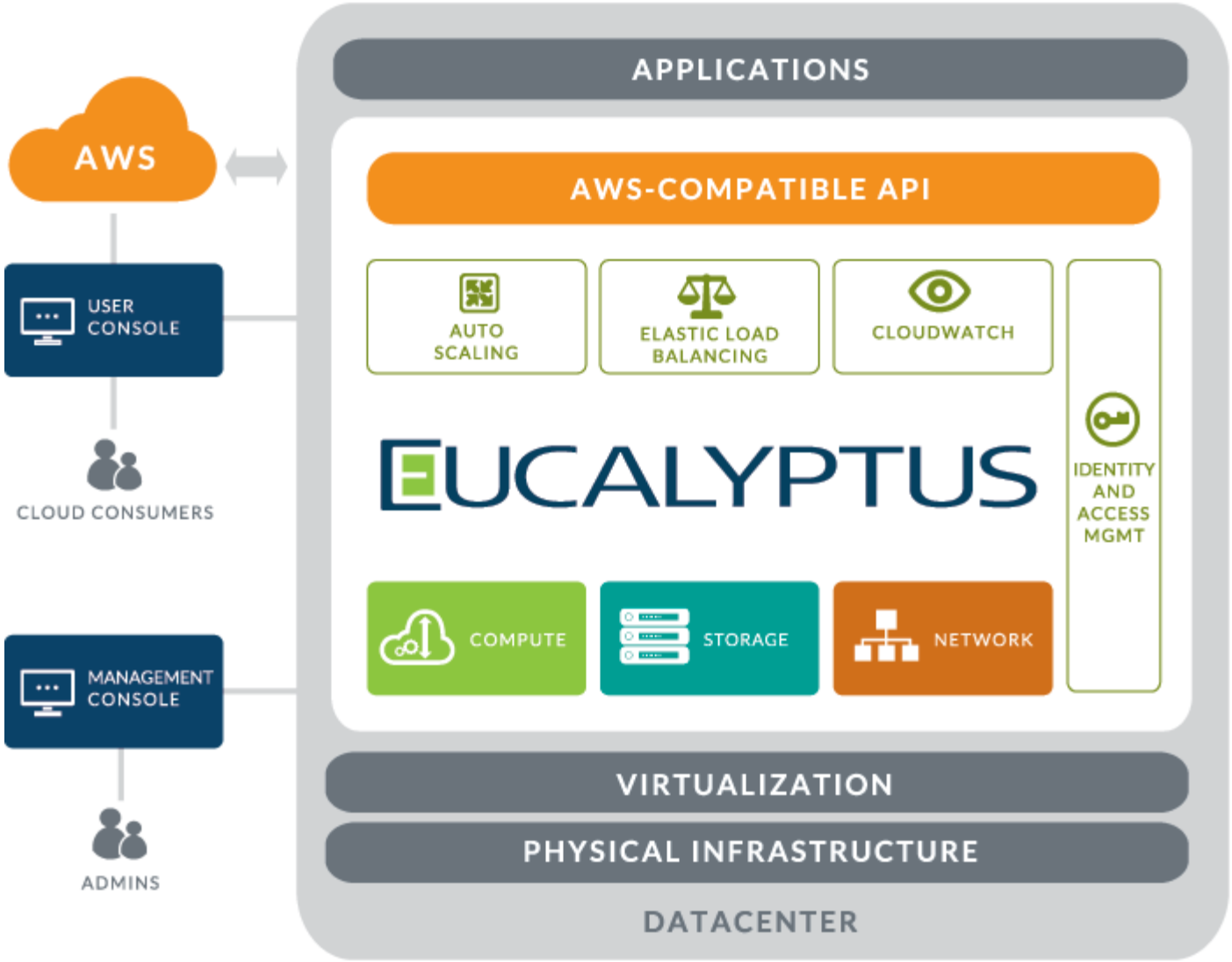
Key Benefits of Eucalyptus

- On-demand Self-service IT Provisioning
  - Secured and Controlled by IT
    - Partitioning, Reporting, Quotas, and Chargeback/Showback
- Scalable infrastructure to quickly apply IT horsepower where needed most
- Seamless integration with Current Infrastructure
- AWS compatibility enables use of broad AWS Toolset, Hybrid cloud flexibility, and On-ramp to AWS
- Deployment across Multiple Hypervisors eliminates vendor lock-in (VMWare, KVM)
- Higher Utilization via Resource Pooling

Eucalyptus Cloud Platform



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Eucalyptus Enterprise Edition

- Up to 24/7 Support
- Vmware ESX hypervisor support
- External iSCSI SAN support
  - NetApp FAS 2000, 3000 and 6000
  - Dell EqualLogic PS 4000, 6000
  - EMC VNX Series

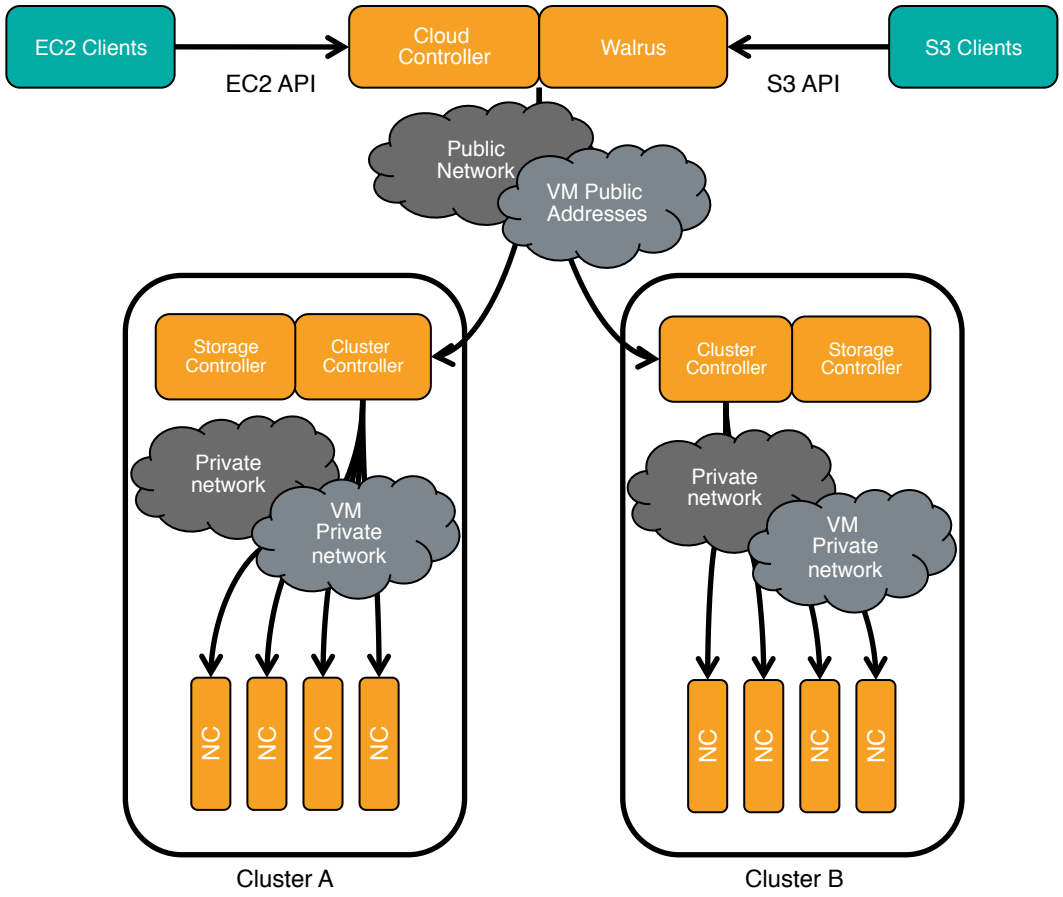
Eucalyptus Customers

Deployment Planning and Installation

- Pre-deployment considerations
  - Planning the deployment
- Datacenter/Linux server management
  - System administration
- Storage resources
  - SAN readiness, disk layout and availability
- Network resources
  - NICs, switches, addresses
- Plan verification
  - Ready to go?

Pre-deployment Considerations

- Overall goal of install
  - Workload
  - Who are the users
  - Reliability
- Scale
  - Users
  - Resources
  - Performance
- Capabilities
  - Storage capacity
  - Server horsepower
  - Network connectivity



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Pre-deployment Considerations

- Determine level of access to
  - People
  - Storage devices
  - Network gear
  - Servers/Server management
- Draw diagrams
  - Used for reference and communication
- For example…

Pre-deployment Considerations

- Spend as much time as possible pre-planning
  - Scale: users, resources, virtual workload
  - Reliability: HA or not, RAID disks, backup strategy
  - Performance: Workload requirements
  - Management: “over time” expectations
- Stay in the loop
  - Better to detect wrong paths sooner
- Use diagrams

Deployment Planning and Installation

- Pre-deployment considerations
  - Minimum requirements and capabilities
- Datacenter/Linux server management
  - System administration
- Storage resources
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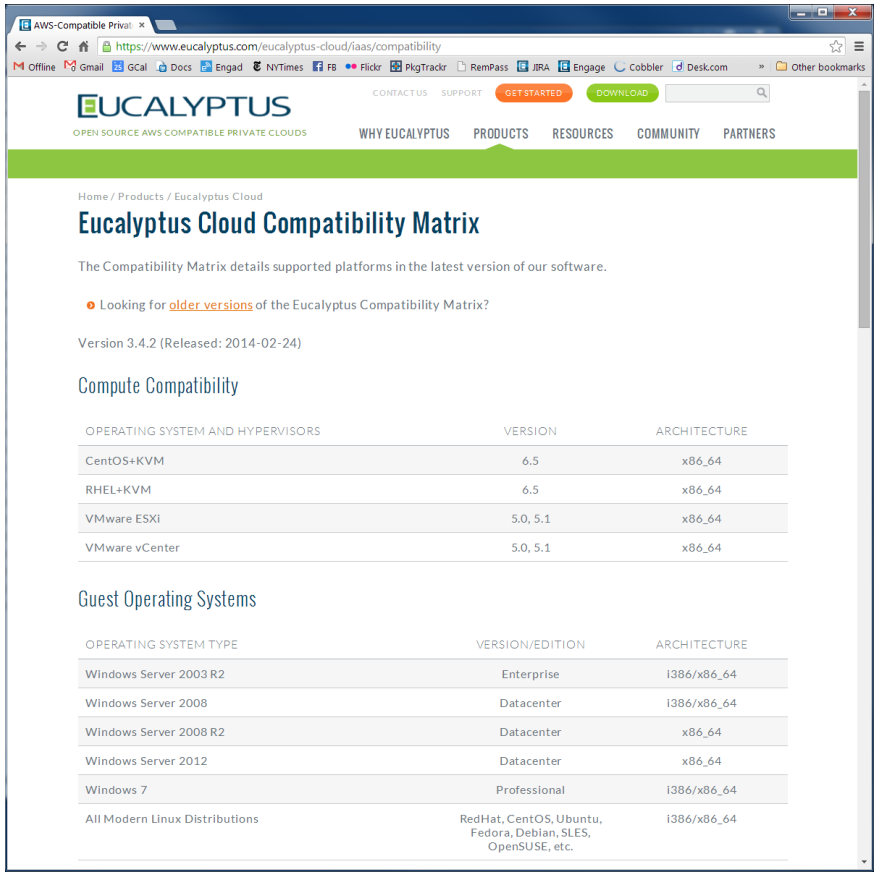
Hardware / Software Requirements

- Frontend Components –
  - Intel/AMD system
  - 8 Cores, 2.4GHz, 8GB RAM, 500GB Disk space. (multiple disks in a RAID 5/10 recommended)
  - RHEL / CentOS 6

- Hypervisor Systems –
  - Intel/AMD systems with hardware virtualization.
  - 8 Cores, 2.4GHz, 8GB RAM, 500GB Disk space. (multiple disks in a RAID 5/10 recommended)
  - RHEL / CentOS 6 with KVM

Compatibility Matrix

https://www.eucalyptus.com/eucalyptus-cloud/iaas/compatibility



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Datacenter/Linux Server Management

- Supported distributions
  - CentOS 6.5, RHEL 6.5
- Software updates restricted to security updates
- Local package mirror or access to Internet
- Remote access via ssh as root
  - Helps if password-less access is available
- Ensure clocks are synced across all systems
  - Using NTP
- Hypervisor setup
  - Hardware virt. is enabled on NCs
  - Bridges configured on NCs
  - Supported version of VMWare is available

Deployment Planning and Installation

- Pre-deployment considerations
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Storage

- Storage capacity
  - All: log-files
  - CLC: Database, web UI
  - Walrus: Bukkits mount point
  - SC: Volumes mount point (non-SAN only), SAN device capacity
  - Vmware Broker: mount point for image cache/preparation
  - NC: mount point for image cache/preparation and running VMs
- Support SAN devices (NetApp, Dell Equallogic, EMC VNX)
  - Have administrative access
- For HA Walrus
  - Set up DRBD volume after package install, but before starting eucalyptus

Deployment Planning and Installation

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Networking Recommendations

- **Network Adapters –** 1GB Minimum, 10GB is even better.
- **Managed** Layer 2 and 3 VM isolation; uses built-in DHCP service Requires a cloud switch to forward a configurable range of VLAN-tagged packets, and requires that any external DHCP service be isolated from Eucalyptus VMs
- **Managed (no VLAN)** Layer 3 VM isolation; uses built-in DHCP service and requires that any external DHCP service be isolated from Eucalyptus VMs.
- Locating Eucalyptus components on their own network switches is recommended when running in Managed Mode.

Edge Mode Networking Primary Characteristics

- Removes the need to place a single Linux server in the data path for all VMs running in a single cluster.
- Removes the need to configure the underlying network to allow passing of VLAN tagged packets for use by Eucalyptus in order to provide VM layer 2 isolation.
- Promotes a more clear separation of concerns between the way networking is implemented and the core back-end of Eucalyptus (i.e. largely remove implementation of networking model from cluster controller/node controller).

Edge Mode Networking

- depending on the type of pre-existing network that is available/put in place, those pre-existing networks need to be in place and ready for Eucalyptus to use. Briefly, Eucalyptus in "EDGE" requires that NCs have an interface configured with an IP on the VM public and VM private network (which may be the same network).
- there must be unused IP addresses on the VM public network for EDGE to use as VM elastic IPs
- there must be unused IP addresses on the VM private network for EDGE to use as VM private IPs
- there must be IP connectivity from the NC machines (where eucanetd runs) and their related CC machine (with eucanetd acting as an HTTP client to the CC).
- there must be IP connectivity from the NC machines (where eucanetd runs) and the CLC, for metadata re-directs for 169.254.169.254 to the active CLC to function.

Network

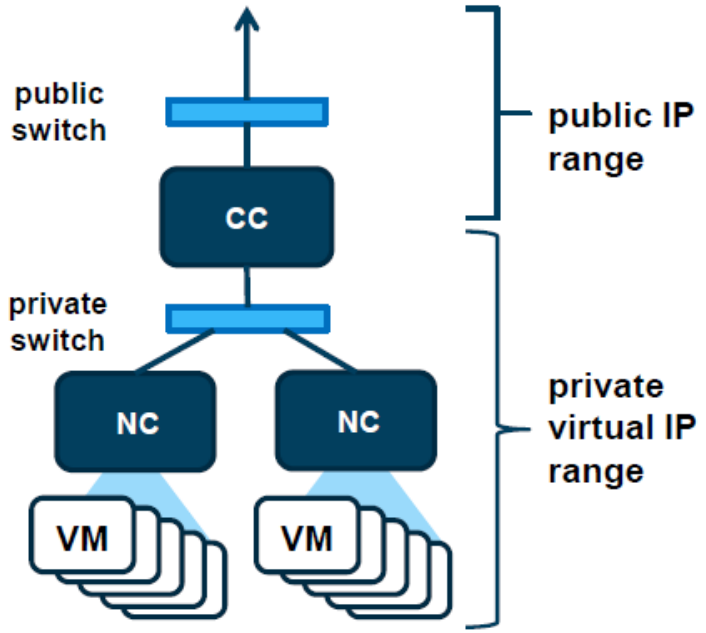
- Physical (Ethernet)
  - CC/NC pools must share common layer 2 network
  - Separate physical networks for VM traffic/EBS storage, if possible
  - CC machine acts as gateway - ensure appropriate pipes
- Logical (TCP/IP)
  - Users -> CLC, Walrus
  - CLC <-> Walrus, CC, SC, Broker
  - Broker -> ESX/vCenter
  - CC <-> NC, CLC
  - NC -> Walrus, SC (or SAN)
- Virtual
  - Select unused IP address network for virtual networks
  - Ensure path from VM to desired end-point is understood/clear

Network

- HA Network
  - Servers must have multiple NICs that can be bonded
  - Separate HA switches in place
- Network Tests
  - DHCP server
    - Not running on the network (unless using SYSTEM network mode)
    - OR ignores requests from eucalyptus VMs (can filter based on eucalyptus VM MAC prefix)
  - VLAN Clean
    - Only in MANAGED mode
    - Required between CC and NCs in that CCs cluster
  - UDP broadcast (multicast)
    - Required between any to java-based components running on separate machines

IP Network Ranges

- In MANAGED(-NOVLAN) mode, virtual machines use two IP address ranges. Why?
- Each virtual machine is assigned two IP addresses
  - A private IP address on the virtual subnet (VM-to-VM)
  - A public IP address for external communication
- Cluster controller maps private IP addresses to public IP addresses
  - In iptables 'nat' table



Eucalyptus physical hosts also require IP addresses

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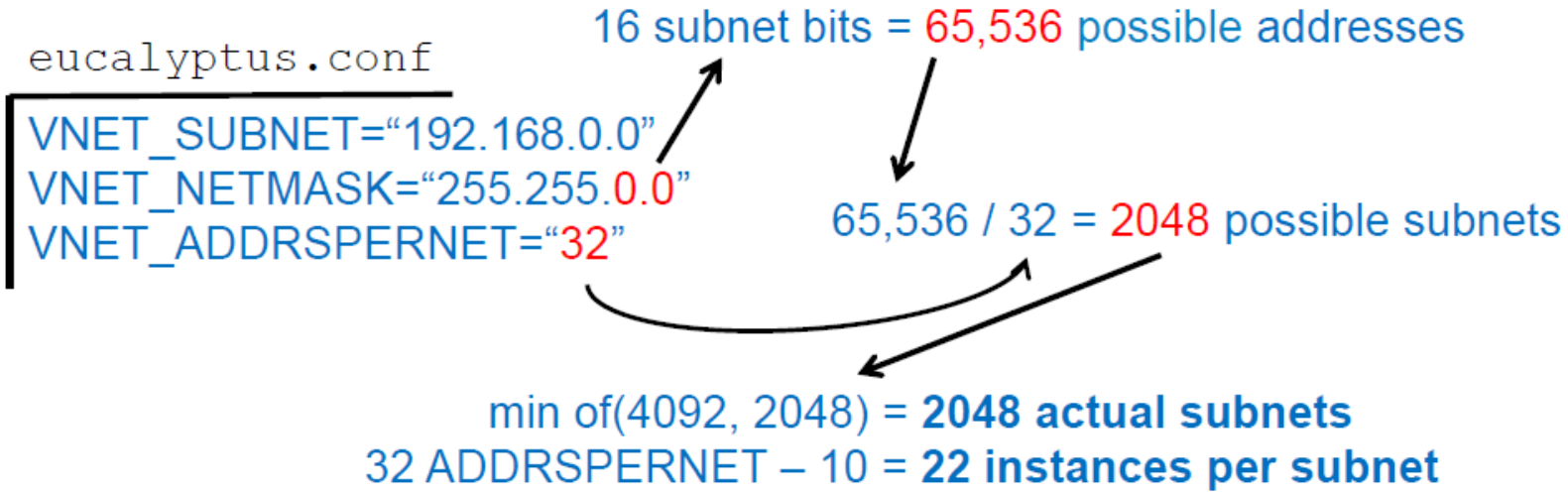
Virtual Private Subnets

- Virtual subnet configuration determines:
  - Maximum number of security groups (one per subnet)
  - Maximum number of instances per security group (subnet)
- 10 IP addresses reserved per subnet (not available for VMs)
  - network number, broadcast address, eight gateway addresses
- 4095 possible VLAN IDs, Eucalyptus can use 2-4094



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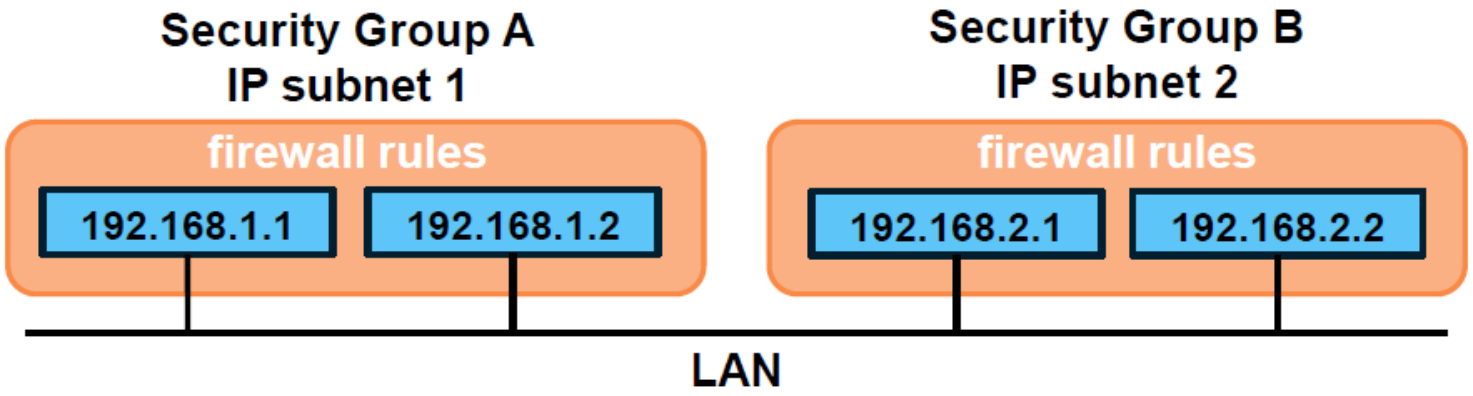
MANAGED-NOVLAN VM Isolation

- VM isolation is managed only at the IP layer through security groups.
  - Entries in iptables 'filter' table
- Multiple subnets but a single LAN
  - An instance in one virtual subnet could network sniff an instance in another virtual subnet.



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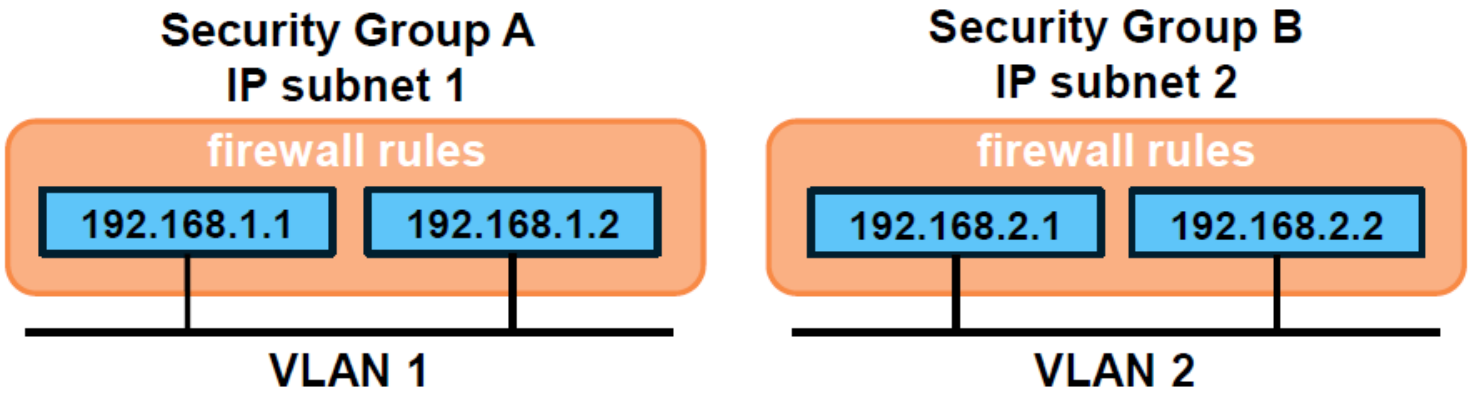
MANAGED VM Isolation

- VM isolation is managed at the IP layer through security groups (iptables 'filter' table) and VLANs (one security group per VLAN)
  - An instance in one virtual subnet cannot network sniff an instance in another virtual subnet



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Plan Verification

- Review Diagrams after setup
  - Will almost surely have changed!
- Reboot test
  - Assume random system boot/reboot scenario
- Test IP and ssh connectivity between hosts, SANs
- Start the install!

Eucalyptus Installation

- Simplified using package repositories
- Order of operations
  - Install front-end components (CLC, Walrus)
  - Install middle-tier components (CC, SC, Broker)
  - Install back-end components (NC)
  - Configure all components (eucalyptus.conf)
  - Initialize CLC
  - Start front-end components
  - Start middle-tier components
  - Start back-end components
  - Register components
  - Download admin credentials
  - Configure run-time parameters

New And Enhanced Features In Eucalyptus 4.0

Based on the feedback from the Eucalyptus community, the following features and improvements are under consideration for 4.0:

- **Scale-out Object Storage Architecture** – Eucalyptus 4.0 will introduce an improved architecture for scale-out S3-compatible object storage with "pluggable" back-end object storage providers. This release will also include integration with Riak CS as an object storage provider. Migrating S3-heavy workloads from AWS to Eucalyptus will be a smooth transition with the highly scalable object storage gateway in 4.0. A technology preview of this feature is available in Eucalyptus 3.4.
- **Expanded Image Management Services** – Eucalyptus 4.0 introduces new services that can reduce the time and effort of building Eucalyptus Machine Images (EMI). These services can be used to automatically ingress and validate new images, alerting users when known or potential issues are found.
- **Edge Networking Mode** – Eucalyptus 4.0 will introduce a new networking mode called Edge Networking; eliminating the need to route all instance traffic through a single Linux server by utilizing existing networking infrastructure. The new mode reduces initial deployment time by integrating with networking infrastructure through a simple configuration procedure. This complements the existing modes, allowing users to select the best fit for their needs. A technology preview of this feature is available in Eucalyptus 3.4.
- **Eucalyptus IAM Account Admin Console** – The Eucalyptus Console will be extended to accommodate account administration activities such as user, group, and policy management.
- **Elastic Load Balancer Enhancements** – We will be extending our Elastic Load Balancer service to support SSL termination as well as session stickiness. These enhancements allow for secure and scalable production deployments that rely on the ELB services in Eucalyptus and enable seamless workload migration between AWS and Eucalyptus clouds.
- **Secure Privileged Personas** – In Eucalyptus 3.4 we have introduced IAM Roles. In 4.0, we are extending this concept of roles and policies to accommodate predefined yet customizable privileged personas for cloud-wide infrastructure and resource administration.
- **Cloudformation** – Configuration management tools such as Chef, Puppet, Ansible enable a repeatable base image or instance deployment. Cloudformation extends that degree of automation through orchestration of a collection of Eucalyptus resources. This simple and easy to use service will be compatible with AWS CloudFormation enabling users to make use of their existing CloudFormation template from AWS on Eucalyptus or vice-versa, improving portability of hybrid workloads. Available as a technology preview feature in 4.0."

Upgrading to 4.0

- Networking modes supported: Managed, Managed No-VLAN, and EDGE
- Upgrading to Edge networking will not be supported.
- System and Static networking modes will no longer be supported.
- Eustore commands will not be available.
- Migration from Walrus to OSG+RiakCS is not supported
- Eucalyptus-OSG will need to be installed

Eucalyptus End-User Portal

Features

- User self-service provisioning of Eucalyptus resources
- Budgeting and chargebacks
- Key Management and encryption
- Shell/RDP user management
- Remote logging
- Virtual Machine Monitoring
- Elastic Block Storage encryption

Benefits

- Rapid and reliable infrastructure service provisioning
- Increased Dev/test teams productivity
- Rapid response to infrastructure configuration changes – better SLAs
- Increased infrastructure operational efficiency

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